

## REPORT ON PARASITES.

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The work on parasites and predatory enemies of the gipsy moth and brown-tail moth has continued along the same lines as during the previous year, except that no attempt has been made to import additional parasites this season. The material imported from Europe last year has been colonized and an effort has been made to determine the extent to which the species secured have established themselves in the field.

Owing to the fact that one of the imported egg-parasites of the gipsy-moth, *Anastatus bifasciatus*, breeds very slowly, extensive collections were made during last winter of parasitized gipsy moth egg-clusters from colonies that were planted in previous years. From this material it has been possible to liberate 1,500,000 parasites of this species, and these have been placed in 1,500 colonies in sections where the insect had not become established. Eight hundred colonies were planted in towns along the western border of infestation, and the balance were liberated in a number of towns in the northern part of Massachusetts. During November of this year collections were made in New Hampshire in the colonies of *Anastatus* that were planted a year ago, and examination showed that these plantings were practically all successful although the spread has been slow. From these collections about 100,000 parasitized eggs were secured and will be used for colonization in New Hampshire next spring.

Investigations have shown that another egg-parasite of the gipsy moth, namely *Schedius kuvanæ* has become perfectly established in several colonies where it has previously been planted. During the past year there has been a decided increase in the abundance of this parasite, and in some cases it has spread nearly a mile and a half from the limits of its last year's spread. The parasites attacking the caterpillars of the gipsy moth have been found more abundantly than during the previous year.

*Compsilura concinnata*, a species of Tachinid fly, was very abundant during the summer of 1912, especially in the territory which was longest infested by the gipsy moth, and

continued to spread during the past summer. It has not been so abundant in the oldest infested territories as in some of the outlying colonies. Collections of more than eleven hundred gipsy moth caterpillars made in four towns in central Massachusetts show a parasitism by this species of over 40 per cent, while similar collections in the central infested area have indicated an average parasitism of about 5 per cent. It is probable that the decrease in parasitism in the old infested area, as far as this species is concerned, is due to the fact that gipsy moth caterpillars are not nearly as abundant as they were during the previous year, and also because of the enormous numbers of the American tent and forest caterpillars which were present in this region and which are also attacked by this parasite.

*Limnerium disparidis* and *Apanteles* species were received from Europe for the first time in 1911 and were planted in several badly infested gipsy moth colonies. Both species were recovered during the summer of 1912, which indicated that it is possible for the insects to withstand our cold winters. In the case of the latter species, as high as 7 per cent of parasitism of gipsy moth larvæ was found. The present summer the *Limnerium* was recovered from a single locality where the species was liberated in 1911. Although it has evidently become established, it has not thus far shown marked ability to increase in the gipsy moth infested area in New England.

Another species of *Apanteles*, namely *A. lacticolor*, an important parasite of the brown-tail moth caterpillars, has been recovered in large numbers and has been found to attack gipsy moth caterpillars in widely separated regions. This species seems to be multiplying more rapidly than any of the other Hymenopterous parasites of the gipsy moth. In order to colonize this species over as wide an area as possible, an arrangement was made with the State Entomologist in New Hampshire and the Superintendent of Moth Work in Maine to liberate as many colonies as possible along the outskirts of the area infested by the brown-tail moth in those states. Small collections of gipsy moth larvæ were made at Melrose, and in some cases ten per cent of the larvæ were killed by this species. In several localities in New Hampshire the past summer cocoons of this parasite were very abundant, and

several hundred were easily collected for experimental work. They were taken for the most part on the foliage of trees and attached to dead caterpillars.

The *Calosoma* beetle (*Calosoma sycophanta*) has been observed in large numbers in towns where bad colonies of the gipsy moth were present. It has not been possible to obtain definite records of the amount of benefit derived from this species or of its abundance, except in cases where trees were burlapped, as these bands furnish favorable hiding places for the caterpillars and are favorite locations for the beetles and larvæ to obtain food. In such cases, where caterpillars were abundant, twenty or more of the *Calosoma* larvæ have frequently been found under a single burlap band on an average sized tree. As they feed upon the pupæ as well as upon the caterpillars, the amount of benefit derived is very great, although it is difficult to figure the percentage of larvæ killed.

From collections made during the winter of 1912-13 it was determined that *Monodontomerus aereus* has spread over practically the entire territory now known to be infested by the brown-tail moth. It was not found in as large numbers as during the previous year. *Pteromalus egregius* has been found widely scattered over the area infested by the brown-tail moth, and its numbers are slowly increasing, judging from the records that have been secured from sample collections.

There is thus no doubt that a number of the imported species are thoroughly established and that they are increasing each year, and further that many hundreds of thousands of caterpillars were killed by them during the past summer.